

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A first mobile communications station configured for communicating among a plurality of mobile stations in a communications network in which stations are arranged in clusters of communication member stations, with one member station in each cluster being a head station for the cluster, each member station communicating with the network through connecting at least one cluster head of communications stations, wherein a cluster has a communications station, the cluster head stations communicating operating as a cluster head for directing communications within and among other cluster head stations the clusters, said first mobile communications station comprising:

an electronic memory circuit having network information stored therein;

a transceiver which transmits signals to and receives signals from the mobile communications stations in the network; and

an electronic processor circuit ~~which~~ configured to (i) ~~evaluates~~ determine the strength of a member beacon signal received from a ~~first~~ second ~~member communications~~ station of the plurality of mobile stations through said ~~transceiver~~ transceivers, and (ii) determines whether to communicate with the ~~first~~ second ~~member communications~~ station directly or to communicate with the ~~first~~ second ~~member communications~~ station by routing messages through ~~at least a cluster head station affiliated to said first mobile communications station based on the signal strength.~~

2. (Currently amended) A first mobile communications station according to claim 1, ~~32~~, wherein the determination by said electronic processor circuit comprises evaluating a received member beacon from the ~~first~~ second ~~member communications~~ station.

3. (Currently amended) A mobile communications station according to claim 2, wherein the determination by said electronic processor circuit further comprises evaluating a received signal strength indicator (RSSI) of the received member beacon.

4. (Currently amended) A first mobile communications station according to Claim 3, wherein said electronic processor circuit directs a message intended for the ~~first~~second ~~member~~communications station via an affiliated cluster head ~~station~~ when the RSSI of the received member beacon from the ~~first~~second ~~member~~communications station is below a predetermined threshold value.

5. (Currently amended) A first mobile communications station according to claim 4,1, wherein the determination by said electronic processor circuit further comprises evaluating a signal from ~~the affiliated~~a cluster head affiliated with the first mobile communications station.

6. (Currently amended) A first mobile communications station according to claim 5, wherein said electronic processor circuit evaluates an RSSI of the signal from the affiliated cluster head ~~station~~.

7. (Currently amended) A first mobile communications station ~~according to claim 6~~,for use in a communications network connecting at least one cluster of communications stations, wherein a cluster includes a cluster head for directing communications within and among the clusters, said first mobile communications station comprising:

an electronic memory circuit having network information stored therein;

a transceiver which transmits signals to and receives signals from mobile stations in the network; and

an electronic processor circuit configured to (i) determine a received signal strength indicator (RSSI) for a second communications station of the plurality of mobile stations based on the signal strength of a member beacon received from the second communications station through said transceiver, (ii) determines a RSSI for a cluster head affiliated with the mobile communication station based on the strength of a signal received by the mobile communication system through said receiver; and (iii) communicates with the second communications station directly ~~communicates with the first member station~~ when the ~~member beacon~~ RSSI of the ~~first member~~second communications station is greater than ~~an~~the RSSI of the affiliated cluster head plus an additional value..

8. (Currently amended) A first mobile communications station according to claim 7, wherein the additional value comprises a fraction of a maximum RSSI of the affiliated cluster

head.

9. (Currently amended) A first mobile communications station according to claim 7, wherein the additional value comprises one-half of the maximum RSSI of the affiliated cluster head.

10. (Currently amended) A first mobile communications station according to claim 7, wherein the ~~first~~second ~~member~~communications station and said mobile communications station are affiliated to a same cluster-group.

11. (Currently amended) A first mobile communications station according to claim 7, wherein the ~~first~~second ~~member~~communications station and said mobile communications station are ~~not~~ affiliated to a ~~same~~different cluster-group.

12. (Currently amended) A first mobile communications station according to claim 7, wherein said electronic processor circuit determines at least one network cost and said mobile communications station directly communicates with the ~~first~~second ~~member~~communications station when the member beacon RSSI of the ~~first~~second ~~member~~communications station is greater than an RSSI of the affiliated cluster head plus an adjusted value minus the cost.

13. (Currently amended) A first mobile communications station according to claim 7, wherein said electronic processor circuit executes a handshake protocol with the ~~first~~second ~~member~~communications station.

14. (Currently amended) A first mobile communications station according to claim 13, wherein a communications link with the ~~first~~second ~~member~~communications station is maintained.

15. (Currently amended) A first mobile communications station according to claim 1, wherein the determination of whether to communicate with the second communications station directly or to communicate with the second communications station by routing messages through a cluster head affiliated to said electronic processor circuit~~first mobile communications station~~ comprises evaluating network bandwidth.

16. (Currently amended) A first mobile communications station according to claim 1,

wherein the stored network information comprises received member beacon information.

17. (Currently amended) A first mobile communications station according to claim 1, wherein said electronic processor circuit determines a communications route based on at least one of a transmission power level of an affiliated cluster head, a required transmission power level to transmit to the ~~first~~second member communications station, node congestion of the affiliated cluster head, and bandwidth optimization.

18. (Withdrawn) A network communications apparatus comprising:

an electronic memory circuit which stores network information;

an electronic processor circuit which (i) directs communication between said apparatus and an affiliated network gateway and a target node, and (ii) decides which out of the affiliated network gateway and the target node to directly communicate with when transmitting messages for the target node; and

a transmitter which transmits communication signals.

19. (Currently amended) In a communications ~~system for communication among plural stations in a network in which stations are arranged in clusters of communication stations with including at least one of the stations in each cluster being of communications stations, wherein a cluster includes a cluster head in each cluster, the cluster head station communicating among other cluster head stations for directing communication within and among the clusters,~~ a method of operating a first mobile communications station comprising ~~the steps of:~~

receiving a beacon message each from a ~~first~~second communications station ~~of the plural stations in the network~~ and a cluster head ~~that is affiliated to~~with the first mobile communications station;

evaluating the signal strength of the beacon messages; and

determining whether to directly communicate with the ~~first~~second communications station or to communicate with the ~~first~~second communications station by forwarding messages through ~~at the cluster head station affiliated to~~with the ~~communications~~first mobile

communication station based on the evaluation of said ~~evaluating beacon step~~messages.

20. (Currently amended) Computer executable code stored on a computer readable medium, the code for operating a first mobile communications station ~~so as to communicate among a plurality of mobile stations in a~~ communications network in which stations are arranged in clusters of communication member stations, with one member station being a cluster head station in each cluster includes at least one cluster of communications stations, a wherein a cluster head station communicating with at least one other cluster head station, said includes a cluster head for directing communication within and among the clusters, the computer executable code comprising:

code to evaluate the signal strength of a beacon received by the first mobile communications station from a firstsecond membercommunications station;

code to direct messages, based on an evaluation of said evaluation code, from the first mobile communications device to the firstsecond membercommunications station (i) through an affiliated cluster head station for directing to the first member station, or (ii) directly to the firstsecond membercommunications station.

21. (Currently amended) In a communications ~~system for communication among plural stations in a network in which stations are arranged in clusters of communication member stations each communicating with each other and~~ including at least one of the member stations in each cluster being a head station of the cluster, the of communications stations, wherein a cluster includes a cluster head stations communicating among other cluster head stations head for directing communication within and among the clusters, a method for configuring the network of stations comprising the steps of:

receiving a beacon issued by a first membercommunications station ~~in at~~ a second membercommunication station of the plural stations;

determining a received signal strength indicator (RSSI) based on the strength of the beacon signal;

comparing at the received signal strength indicator (RSSI) of the received beacon with a

predetermined RSSI value; and

determining whether the second member station should communicate directly with the first ~~member~~communications station based at least in part on the comparison of said comparing step.

22. (Currently amended) In a communications ~~system for communication among a plurality of member stations in a network in which the member stations are arranged in clusters of communication member stations with one of the member stations in each cluster being a~~ including at least one cluster of communications stations, wherein a cluster head, a cluster head station communicating with at least one other includes a cluster head station for directing communication within and among the clusters, a method of operating a first communications station so as to route a message to a firstsecond ~~member~~communications station ~~of the plurality of member stations comprising the steps of:~~

receiving a signal from the ~~first member~~second communications station and determining a received signal strength (RSSI1) for the signal based on the strength of the received signal, and;

receiving a signal from an affiliated cluster head ~~station~~ and determining a received signal strength (RSSI2) for the signal based on the strength of the received signal;

determining a value (X) representing a relationship between a maximum received signal strength and a received signal strength for a signal between the ~~first member~~second communications station and the affiliated cluster head ~~station~~; and

transmitting a signal directly to the ~~first member~~second communications station when:

$$RSSI1 > RSSI2 - X.$$

23. (Currently amended) The method according to Claim 22, wherein the message to be sent to the ~~first member~~second communications station is relayed through the affiliated cluster head when the condition $RSSI1 > RSSI2 - X$ is not met.

24. (Currently amended) The method according to Claim 22, wherein the signal from

the ~~first member~~second communications station is discarded when RSSI1 is below a predetermined value and the message to be sent to the first mobile station is relayed through the affiliated cluster head.

25. (Currently amended) The method according to Claim 22, wherein the relationship of said determining step is the maximum received signal strength minus the received signal strength for a signal between the ~~first member~~second communications station and the affiliated cluster head ~~station~~.

26. (Original) The method according to Claim 22, wherein the relationship of said determining step is approximated by the maximum received signal strength minus a fraction of the maximum received signal strength.

27. (Original) The method according to Claim 22, wherein the relationship of said determining step is approximated by the maximum received signal strength minus one-half of the maximum received signal strength.

28. (Withdrawn) A network communications apparatus comprising:

storage means for storing network information;

directing means for directing communication between said apparatus and either an affiliated network gateway or a target node;

determining means for determining which out of the affiliated network gateway or the target node to directly communicate with when transmitting messages for the target node; and

transmitting means for transmitting communication messages.

29 - 31 (Cancelled).

32. (NEW) A first mobile communications station for use in a communications network connecting at least one cluster of communications stations, wherein a cluster includes a cluster head for directing communications within and among the clusters, said mobile communications station comprising:

an electronic memory circuit having network information stored therein;

a transceiver which transmits signals to and receives signals from other communications stations in the network; and

an electronic processor circuit configured to determine whether a second communications station is within one radio hop from the first mobile communications station and to (i) communicate directly with the second communications station if the second communications station is determined to be within one radio hop; or (ii) communicate with the second communications station through a cluster head if the second communications station is determined to not be within one radio hop from the first mobile communications station.

33. (New) A first mobile communications station according to claim 32, wherein the second communications station and the first mobile communications station are affiliated to a same cluster.

34. (New) A first mobile communications station according to claim 32, wherein the second communications station and the first mobile communications station are affiliated to different clusters.

35. (New) A first mobile communications station according to claim 32, wherein said electronic processor circuit executes a handshake protocol with the second communications station.

36. (New) A first mobile communications station according to claim 35, wherein a communications link with the second communications station is maintained.

37. (New) A first mobile communications station according to claim 2, wherein the determination by said electronic processor circuit further comprises evaluating a received signal strength indicator (RSSI) of the received member beacon.

38. (New) In a communications network including at least one cluster of communications stations, wherein a cluster includes a cluster head for directing communication within and among the clusters, a method of operating a first mobile communications station comprising:

determining whether a second communications station in the network is within one radio hop from the first mobile communications system;

communicating directly with the second communications station if the first mobile communications station is determined to be within one radio hop; and

communicating with the second communications station through a cluster head if the second communications station is determined to not be within one radio hop from the first mobile communications station.

39. (New) A method of operating a communications station according to claim 33 comprising:

receiving a beacon message from the second communications station; and

evaluating the signal strength of the beacon message; and

wherein the determining of whether the second communication station is within one radio hop from the first mobile communications station is based on the signal strength evaluation.

40. (New) Computer executable code stored on a computer readable medium, the code for operating a first mobile communications station in a communications network which includes at least one cluster of communications stations, wherein a cluster includes a cluster head for directing communication within and among the clusters, the computer executable code comprising:

code for determining whether the second communications station is within one radio hop from the communications station; and

code to direct messages (i) directly to the second communications station if the second communications station is within one radio hop of the first communications station and (ii) to the second communications station through an affiliated cluster head if the second communications station is not within one radio hop of the communications station.

41. (New) Computer executable code stored on a computer readable medium according to claim 36 comprising:

code for evaluating a signal strength of beacon message received from the second communications station; and

wherein the determining of whether the second communication station is within one radio hop from the first mobile communications station is based on the signal strength evaluation.